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ABSTRACT

The study involving 60 undergraduate students investigated sign language as a function of sign translucency (the perceived relationship between a sign and its referent) and referential concreteness. Translucency and concreteness levels were varied and naive sign language learners attempted to learn a list of sign referent pairs. Results indicated that signs high in translucency and referents high in concreteness facilitated learning while low levels of each variable inhibited list learning. Mixed condition list conditions led to intermediate learning performance. Implications for choosing initial sign lexicons for severely language impaired, nondeaf populations (e.g., the mentally retarded) are discussed. Tables and a graph offer statistical data. (Author/SB)

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Manual Sign Translucency and Referential Concreteness in the Learning of Signs

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Sign Translucency and Referential Concreteness

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Manual Sign Translucency and Referential Concreteness in the Learning of Signs

As the use of manual signs grows as an alternative to spoken communication for severely language impaired populations (e.g. the severely mentally retarded), a question arises as to the learnability of the signs to be taught (Fristoe & Lloyd, 1979). Other than knowledge that a concept should be present before a sign is taught, or that a sign should be easy to produce, there is relatively little information on which to base predictions of sign learnability.

Recent investigations into properties of sign language indicate that sign systems may be subjected to the same types of analyses as spoken languages (Bellugi & Klima, Note 1; Frishberg, 1975; Stokoe, 1978). Investigations have analyzed sign systems in terms of their semantic and lexical components (Bonvillian, Nelson, & Charrow, 1976; Frishberg, 1975; Jordan, 1975; Jordan & Battison, 1976), and on their effectiveness as communication systems (Hoemann, 1972; Jordan, 1975; Jordan & Battison, 1976). However, a major difference between spoken and sign systems is that signs require manual production while spoken words do not. It has been demonstrated that both the manual productions of signs and the referential concepts which signs represent influence sign learning (Conlin & Paivio, 1975; Odom, Blanton, & McIntyre, 1970). Within sign learning, sign iconicity (guessability) has been the main variable of investigation (Brown, Note 2; Hoemann,1972).

Likewise, variables such as associative meaningfulness and concreteness/ abstractness have been shown to influence verbal learning (Paivio, 1971; Paivio, Yuille, & Rogers, 1969).

The phenomenon of translucency is related to iconicity but is not identical to it. While iconicity refers to the guessability of a sign, translucency refers to the perceived relationship between a sign and its referent (Bellugi & Klima, Note 1). Although iconic signs are transparent and translucent, it does not necessarily hold that translucent signs are iconic. It has been estimated that only 10%-15% of American Sign Language (ASL) signs are iconic (Bellugi & Klima, Note 1; Hoemann, 1975) while it has been suggested that a much higher proportion of ASL signs are translucent (Luftig, Page,& Lloyd, Note 3).

In the acquisition of manual sign by naive sign learners, the linking of the sign to its referent by perceiving the relationship between the two may be viewed as being similar to S-R learning in a paired-associate paradigm. That is, the naive sign learner is usually taught a sign by being shown the sign and told its meaning rather than by being shown a sign and guessing the meaning. Afterward, the sign is assumed to be learned when the student can make the sign when given the referent, can orally tell the referent when shown the sign, or can use the sign spontanously in language appropriate contexts. Thus, in learning a given sign, acquisiton of sign and referent should be realitively easy to learn when the sign is translucent, even if the sign is not iconic. Conversely, for signs low in translucency (and also low in iconicity) learning of a

sign-referent pairs should be relatively difficult.

Unfortunately, most investigations of sign learnability have focused on iconicity rather than translucency (e.g. Bregan,1970; Brown, Note 2; Hoemann, 1975). However, a study conducted by Luftig, Page, and Lloyd (Note 3) has indicated that sign language naive college students may rate signs to be high in translucency which have previously been judged to be low in iconicity. Thus, it could be possible that a sign rated to be relatively unguessable might be easily learnable when the sign and the referent were provided to the learner. However, a review of the relevant literature did not uncover controlled studies where high and low levels of translucency were manipulated to investigate the effects on sign learning.

Regarding referents, concreteness/abstractness has shown to be a significant variable in the learning of word lists (Begg & Robertson, 1973; Bull & Wittrock, 1973; Craig, 1973; Foth, 1973; Paivio, 1971; Paivio, Yuille, & Rogers, 1969). According to Harrell, Bowers, and Bacal (1973), concrete referents are concepts which have a corresponding and unitary sense data base in the phenomenal world. As a concept begins to include relationships between sensory data alone or as the psychological distance from the concept to the corresponding sense data increases, concepts become more abstract. High concreteness has been shown to facilitate learning in a variety of situations with normal learners (Bower, 1972; Paivio & Csapo, 1969; Paivio, Yuille, & Rogers, 1969), in deaf learners (Craig, 1973; Heinen, Stock, & Tharinger, 1974; Heinen, Cobb, & Pollard, 1976; Paivio & Okovita, 1971), and in the mentally

retarded (Taylor, Joshberger, & Knowlton, 1972; Yarmey & Brown, 1972). Despite this strong relationship between concreteness and verbal learning, concreteness has been largely overlooked in predicting sign learnability. Only one study was found where imagery/concreteness level was manipulated in sign learning. In that study, Conlin and Paivio (1975) found that high concreteness levels combined with ease of signability facilitated sign learning with deaf students.

The current experiment investigated the effects of high and low levels of translucency and concreteness on the learning of manual signs by sign naive adult learners. Translucency and concreteness were varied in combination so as to ascertain the contribution of each variable on sign learning. It was hypothesized that both variables would be significant contributers to the ease or difficulty of learning a list of manual signs.

Methodology

Subjects. Sixty undergraduates at Purdue University particiapated in the experiment for partial course credit. Subjects were recruited from an introductory course in educational psychology and represented a variety of undergraduate majors in education and the humanities. Subjects possessed no uncorrectable visual defects, had essentially normal hearing, and had no familiarity with American Sign Language (ASL) or other sign systems. All subjects were native English speakers.

Materials. Stimulus and response terms were presented via a 19 inch black and white television connected to a video tape playback

unit. The stimuli consisted of ASL signs transmitted via videotape by a signer familiar with ASL. Response terms consisted of sign referents printed graphically and presented on the television screen.

Conditions. There were four conditions.

1. High Translucency- High Concreteness: Signs were chosen from a population of signs rated 5.50 or higher on the Luftig, Page, and Lloyd (Note 3) seven point rating scale of sign translucency. This translucency rating scale was produced by having an independent group of 120 college raters similar to the population of subjects utilized in the present experiment rate 800 ASL signs for translucency. None of the subjects who participated in the rating task participated in the current learning experiment. Referents included in this list condition were concepts rated 5.50 or higher on the Paivio, Yuille, and Madigan (1969) seven point scale for concreteness/abstractness.

2. High Translucency-Low Concreteness: Signs included in this condition were rated 5.50 on the Luftig et al. (Note 3) Translucency Scale. Referents were rated 2.50 or lower on the Paivio et al (1969) scale. Ratings of 2.50 or lower indicated that these words were judged to be relatively abstract by the college raters.

3. Low Translucency-High Concreteness: Signs in this condition were rated 2.00 or lower for translucency. These low translucency ratings signified that raters saw relatively little relationship between sign and referent. Referents in this condition were judged 6.00 or higher for concreteness.

4. Low Translucency-Low Concreteness: Both sign translucency and referent concreteness were rated 2.75 or lower, the only exception being two words which were rated between 2.81 and 3.05 for concreteness.

Table 1 contains the four lists of stimuli used and the translucency and concreteness ratings for signs and referents.

Table 1 about here

Method. Subjects were randomly assigned to one list condition and attempted to learn 15 ASL signs and their referents via a paired associate paradigm. Signs were presented on the television screen by the signer and following transmission of the sign, the screen went blank. The referents were printed graphically on the screen and appeared four seconds after the onset of the sign. Subjects were asked to guess the referent of the presented sign between the time that the sign was transmitted and the appearance of the referent. There were fifteen sign-referent pairs in each list condition. Each subject received seven randomization trials on the list. Subjects participated in only one list condition.

Results and Discussion

Data were analyzed using a 4 (group) x 7 (trial) analysis of variance with repeated measures on the second factor (trials). Analysis revealed a significant main effect for group, $F(3,56)= 56.56$, $p < .01$, trials, $F(6,336)=634.50$, $p < .01$, and the group x trials interaction, $F(18,336)=26.89$, $p < .01$. Figure 1 shows the mean number if sign-referent pairs learned by each group.

A Newman-Keuls test was conducted on differences between experimental groups. Performance on the High Translucency-High Concreteness list conditions was better than on all other list types,

($p < .05$). The performance on the Low Translucency- Low Concreteness condition was significantly worse than all other groups ($p < .05$). The two mixed list conditions were not different from each other in terms learning performance.

Discussion

Both sign translucency and referential concreteness were shown to significantly influence the learning of lists of sign-referent pairs. Additionally, these factors had a cumulative effect in that learning was significantly facilitated when both factors were high and inhibited when both factors were low.

The finding that referential concreteness influences the learning of manual sign extends the work conducted by Paivio and his associates in that signs which represented concrete concepts were more readily learned than signs which represented abstract concepts. Likewise, the finding that signs which are perceived to have a strong relationship with their referents are more readily learned than signs perceived to have little or no relationship with their referents extends the work into relationships between sign iconicity and translucency. Brown (Note 2) has argued that initial sign language vocabularies may be easier to learn than initial spoken languages by young children because initial sign lexicons tend to be more iconic. However, since proportionally more ASL signs have been judged to be translucent than are iconic (Hoemann, 1975; Luftig, Page, & Lloyd, Note 3) it may be that sign translucency would be a greater predictor of sign learnability than iconcity for severely language impaired populations like the mentally retarded. Further research is needed into the nature of sign production and sign referents to gauge the degree that iconicity and translucency correlate in the learning of sign.

This study only investigated high and low levels of translucency and concreteness. It did not investigate the interactive relationship of intermediate levels. Further inquiry into this subject would do well to investigate this topic. It may be that there is an optimal level or threshold for both variables at which sign learning is facilitated or inhibited. Such identification of these thresholds would go far in identifying signs which would be most readily and efficiently learned.

It should also be pointed out that perceptions of perceived relationship between sign and referent may be an affair largely based on culture and world knowledge. That is, what is judged to be translucent for one population may be judged to be opaque by another. The sign for "milk" is a case in point. Milk is signed in ASL by the gesture of one pulling on the udders of a cow. This sign was most probably both iconic and translucent 100 years ago. It probably remains so for rural children living on dairy farms today. But what of the inner city urban dweller? To him/her, milk may be something that is bought at the store in a cardboard container. Thus, for this population of signer, the sign for "milk" may be relatively opaque. More research needs to be conducted on the iconicity and translucency of signs as a function of culture and world knowledge before decisions can be made as to the ease or difficulty of learning given signs.

The finding that sign translucency is a factor in the learning of signs holds implications for the selection and teaching of signs to groups of severely language impaired populations like the severely mentally retarded. Traditionally, signs-to-be-taught to this population have been chosen on the basis of concreteness and word

frequency alone. Thus, signs such as "shoe", "dog", and "mother" have frequently been taught to severely mentally retarded populations on the basis of the frequencies of these words in everyday usuage of handicapped children. However, since these signs have been rated by college judges to be relatively opaque (Luftig, Page, and Lloyd, Note 3), it might be that such children might experience difficulty in learning signs such as these. Educators interested in teaching a large number of initial signs to these types of individuals, might be best served by taking both concreteness and translucency into consideration as well as considerations regarding word frequency. However, replication of these results with mentally retarded populations are needed before the findings can be generalized. It may be that what is translucent to college raters may not be translucenct to mentally retarded populations. Like beauty, translucency may be in the eyes of the beholder.

Notes

1. Bellugi, U., & Klima, E.S. Two faces of sign: Iconic and abstract. Paper presented at the conference on origins and evolution of language and speech. N.Y.: New York Academy of Science, 1975.

2. Brown, R. Why are signed languages easier to learn than spoken languages? Paper presented at the National Symposium of Sign Language Research and Teaching. Chicago: 1977

3. Luftig, R.L., Page, J., & Lloyd, L.L. Translucency ratings of 800 ASL signs. Manuscript in progress, 1980.

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Table 1

Sign-Word Lists for Experimental Groups

High Translucency- High Concreteness

Word	Translucency		Concreteness	
	$\bar{x}$	SD	$\bar{x}$	SD
Circle	6.97	.16	6.00	1.58
Arrow	6.68	.58	7.00	0.00
Photograph	6.66	.64	6.56	0.52
Accordian	6.60	.88	7.00	0.00
Shotgun	6.74	.61	6.96	0.53
Chin	6.91	.28	6.91	.53
Baby	6.88	.32	6.90	.57
Trumpet	6.74	.56	7.00	0.00
Lip	6.74	.50	6.93	.56
Arm	6.91	.37	6.96	.53
Hammer	6.66	.73	6.96	.53
Piano	6.23	1.09	6.85	.86
Harp	6.66	1.11	6.94	.61
Golf	7.00	0.00	6.10	1.17
Juggler	7.00	0.00	6.45	.84

Table 1 (Cont.)

Sign-Word Lists for Experimental Groups

Low Translucency- High Concreteness

Word	Translucency		Concreteness	
	$\bar{X}$	SD	$\bar{X}$	SD
Jelly	1.98	1.40	6.73	0.70
Library	1.94	1.28	6.87	0.60
Nephew	1.91	1.31	6.19	1.07
Furniture	1.91	1.07	6.83	0.61
Soil	1.94	1.08	6.87	0.64
Grass	2.14	0.97	6.96	0.53
Doll	1.89	0.99	6.94	0.55
Potato	2.06	1.14	7.00	0.00
Teacher	1.94	1.02	6.38	0.96
Market	1.77	1.00	6.08	1.07
Flower	1.63	0.84	6.96	0.53
Apple	2.09	1.41	7.00	0.00
Home	1.89	1.32	6.25	1.26
Person	1.86	1.24	6.51	0.85
Metal	2.00	0.80	6.76	0.74

Table 1 (Cont.)

Sign-Word Lists for Experimental Groups

High Translucency- Low Concreteness

Word	Translucency		Concreteness	
	$\bar{X}$	SD	$\bar{X}$	SD
Intellect	5.34	1.41	1.83	1.37
Ignorance	5.34	1.33	1.75	0.90
Suppression	5.80	1.13	2.35	1.19
Love	5.89	1.16	1.80	1.59
Panic	5.83	1.25	2.18	1.16
Thought	6.13	1.33	1.28	0.61
Idea	5.43	1.01	1.42	1.13
Blessing	6.20	0.83	1.75	1.14
Discovery	5.77	0.84	3.06	1.59
Comparison	6.40	0.91	2.69	1.56
Time	6.54	0.88	2.47	1.68
Greed	5.31	1.10	1.73	1.14
Affection	6.00	0.84	2.18	1.68
Prayer	6.51	0.66	3.60	2.07
Silence	6.69	0.47	3.09	1.59

Table 1 (Cont.)

Sign- Word Lists for Experimental Groups

Low Translucency-Low Concreteness

Word	Translucency		Concreteness	
	$\bar{X}$	SD	$\bar{X}$	SD
Hope	2.66	1.55	1.18	0.48
Fun	2.51	1.42	2.45	1.34
Prestige	2.47	1.48	1.73	0.71
Interest	2.65	1.37	2.20	1.43
Duty	2.37	1.23	2.32	1.34
Democracy	2.20	1.34	1.79	1.19
Atiitude	2.60	1.75	1.83	1.19
Kindness	2.71	1.60	1.63	1.05
Opportunity	2.42	1.22	2.63	1.65
Chance	2.17	0.99	1.51	0.85
Method	2.63	1.28	2.20	1.24
Nonsense	2.57	1.17	1.90	1.30
Situation	2.14	1.06	2.76	1.41
Science	2.02	1.12	3.05	1.55
Crisis	2.49	1.31	2.81	1.47

Number of Sign Referent Pairs Learned by Groups